

THE MIRAGE.*

IF in summer we look at objects visible across a field heated by the sun, they seem to waver, and their shapes continually change. This effect is accounted for by the crossing and recrossing of thin streams of cold and warm air rising and descending. The luminous rays, in passing through them, modify their movements at nearly every instant.

The phenomenon known as the *mirage*, of which the most remarkable examples are met with in Egypt, have an analogous origin. In that country the atmosphere is usually calm and extremely pure. At sunrise remote objects can be seen with the most perfect distinctness. From the borders of the Nile to the limits of the desert arise, from point to point, small eminences crowned with villages and groves of palm-trees, which look down upon each year's inundation of the river. Gradually, as the sun climbs above the horizon, the ground, becoming heated, imparts its superior temperature to the lower strata of the atmosphere. At such times the undulating, tremulous motion of which we have spoken is frequently noticed. But when there is no wind, and the dead calm of the atmosphere allows the lower strata to expand without commingling with those that are resting upon them, the spectator might fancy that he had before him a huge lake, in the midst of which are seen the images reversed of the surrounding eminences, and the villages that are built upon them. The magnificent blue sky seems to be reflected in it too, but, as one approaches, the imaginary sheet of water fades away, leaving only the burning sands in its place, while farther away the same deceptive picture is reproduced under a different aspect.

These appearances often misled the French troops in Egypt. Worn out with forced marches, dying of thirst under the scorching heat of an African sun, and choked by the clouds of sand that filled the air, they would rush headlong toward the fancied shore before them, but the delusive shore, alas! always fled farther and farther at their approach.

To the distinguished *savant*, Monge, who accompanied the French expedition into Egypt, is due the elucidation of this phenomenon. He has demonstrated that the most rarefied strata of air, in this case being the lowermost, a luminous ray darting from an elevated object toward the ground, deflects more and more in consequence of refraction, up to the moment when it is reflected from a last stratum, as it would be from a mirror, and then rises again, subject to a series of refractions the reverse of those first encountered. It thus, at last, strikes the eye of the observer in the same direction as though it came from a point situated below the level of the soil, presenting the reversed images as they would appear if he saw them on the surface of a placid lake.

Mariners frequently get a view of the *mirage* under circumstances the opposite of those that we have just set forth. The temperature of the sea being colder than that of the superincumbent strata of air, renders them less dense below than above, and the reversed picture of distant shores or vessels is defined on the atmosphere itself. Cap-

* From "Meteors and Meteoric Phenomena," translated from the French, and in press by D. Appleton & Co.

tain Scoresby made many such observations in the waters of Greenland.

On the 19th of June, 1822, says this accomplished navigator, in one of his narratives, the sun was very warm, and the coast seemed suddenly to come from fifteen to twenty miles nearer. The highlands were raised so much to the view, that we could see them as well from the deck of the ship as we could previously from the foretop. The ice on the horizon assumed the most singular forms; huge blocks looked like pillars and columns; the icebergs and field-ice resembled a chain of prismatic rocks, and at many points the ice appeared to be in the air

at a considerable height above the horizon. The ships that happened to be near us had the most fantastic aspect. On some of them the mainsail seemed to be reduced to a mere nothing, while the foresail looked several times as large as it really is.

Above the vessels, at a distance, we saw an exact picture of them, but reversed and magnified. In some cases this was at quite an elevation above the ship, but then it was always smaller than the original. For some minutes we saw the image of a vessel that was really below the horizon, and one ship was surrounded by a picture of two like it, the one upright and the other reversed.

Among the numerous varieties of this phenomenon of the *mirage*, the one observed by Messrs. Soret and Jurine on the Lake of Geneva, which might be correctly styled the *lateral* or *horizontal* mirage, is not the least curious. These gentlemen were at a window in the second story of a house close to the shore, and were looking with a spy-glass at a number of sail-boats passing from right to left in the middle of the lake, while, nearer to the shore, the same fleet of boats appeared to be sailing in exactly the opposite direction! This was an illusion analogous to the Egyptian mirage, and explicable in the same way. Close to the shore the air had been in the shade a part of the morn-

ing, and was comparatively cooler, while out in the open lake it had been heated by the blaze of the sun. Hence, *vertical* strata of air of different densities had remained motionless, or nearly so, in the prevailing calm, and refraction had produced its magical effects from side to side, instead of above and below, as in the cases previously detailed.

When, instead of occurring in level and regular strata, these effects of refraction and reflection take place in curved and irregular strata, a mirage is produced in which the images are distorted in every respect, broken or repeated over and over again, and separated for considerable distances from each other. This is what takes

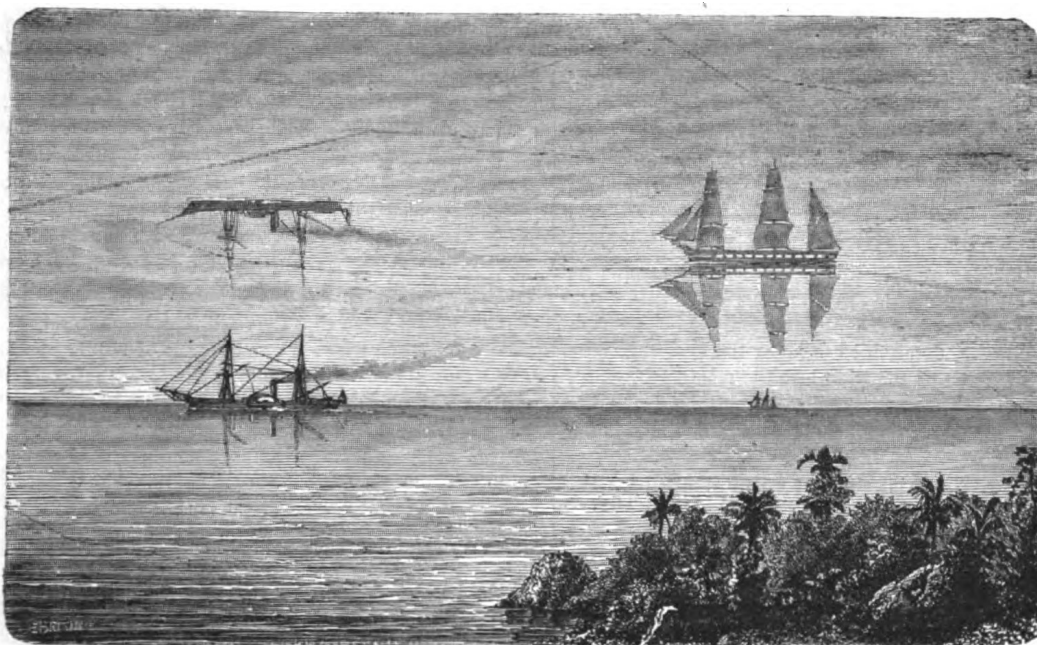
place in the fantastic aerial vision formerly ascribed to the fairy *Fata Morgana*, and sometimes attracts multitudes to the seashore at Naples, and at Reggio, on the Sicilian coast.

"For an extent of several miles along the coast of Sicily," says an eye-witness of this extraordinary spectacle, "I saw the sea assume the

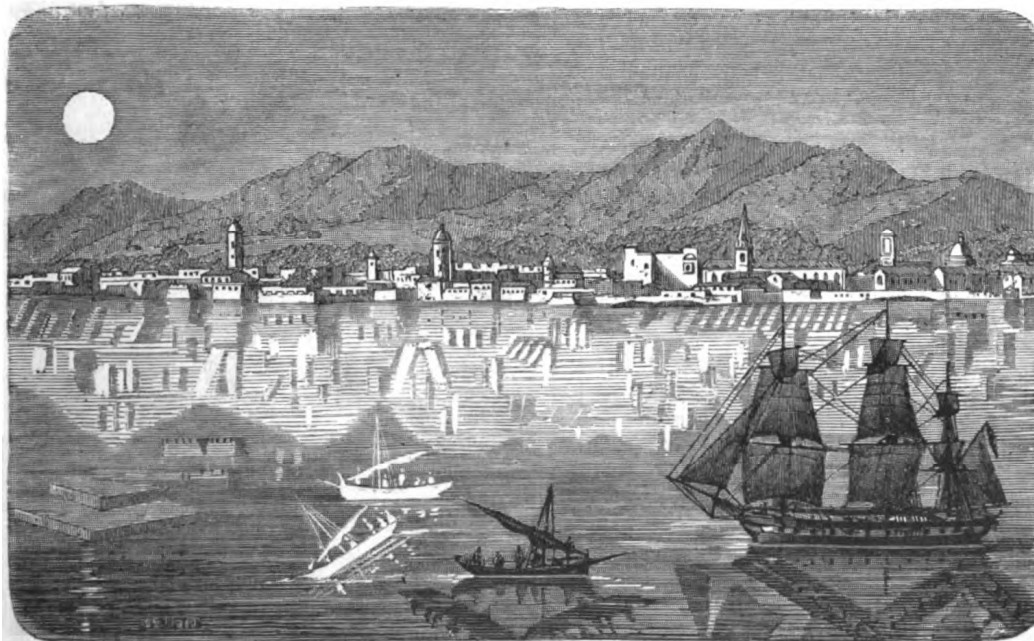
appearance of a chain of gloomy mountains, while the waters in the direction of Calabria remained perfectly smooth. Above them were seen, in *chiaro-oscuro*, a range of many thousand pillars, all of equal height, distance, and degrees of light and shade. In the twinkling of an eye, these pilasters lost half their height, and seemed to

bend over, and resolve themselves into arches and arcades like the old Roman aqueducts. Then, a cornice formed along the top, and an endless number of castles, all alike, appeared. These presently faded away into towers that vanished also, leaving nothing visible but a long colonnade, succeeded, in its turn, by windows, and then by pines and cypresses, also indefinitely repeated."

Sometimes these objects are depicted in the sky at a great height above the ground. On such occasions some of them are in rapid motion, while others are at rest. Their outlines often gleam with rainbow colors, and, as the light augments, their form becomes more and



A Mirage at Sea.



The Fata Morgana.

more aërial, until they melt away and disappear when the sun shines forth in all its splendor.

Bernardin de Saint Pierre relates the following incidents :

"A very singular phenomenon was once described to me by our celebrated painter Vernet, who was my friend. During his youth, when in Italy, he devoted himself particularly to the study of the sky, a more interesting branch of his art, no doubt, than the study of the antique, since it is from the sources of light that the colors and aërial perspectives issue that form the charm of pictures, as well as of nature itself. Vernet, in order to fix their variations, had conceived the idea of painting on the leaves of a book all the shadings of each principal color, and then had marked them with different numbers. When he was designing a sky, after having sketched out his rough draft, and the forms of the clouds, he would rapidly note down all the fugitive tints on his canvas, with figures corresponding to those in his book, and then color them at his leisure. One day he was greatly astonished to see in the sky the appearance of a city reversed. He could perfectly distinguish the steeples, the towers, and the houses. He hurriedly made a sketch of the phenomenon, and then, determined to know the cause of it, he set out following the direction of the wind into the mountains. But, what was his surprise when, some twenty miles distant, he found the very city the spectre of which he had beheld in the sky, and had a sketch of it in his portfolio."

It is, perhaps, to the effects of mirage that we must attribute the extraordinary faculty of sight once so famous on the *Ile de France*. Toward the close of the last century a colonist, named Bottineau, could make out vessels below the horizon, which were still a considerable distance. The new science which he pretended to have constructed by combining the effects produced by distant objects, upon the water and upon the atmosphere, he called *Nauscopy*. He went to Paris, provided with letters from the intendant and the governor of the island, attesting the reality of his discovery; but he could not even succeed in obtaining an audience with M. de Castries, who was then Minister of Marine. No one took the pains to investigate the means by which he mastered such surprising results. In the latter, Arago was not altogether an unbeliever, as we glean from his efforts to discover whether certain phenomena of the twilight, in which the shadows of distant mountains probably play a part, would not help to clear up this important secret. The poor colonist returned to his home, on the Isle of France, where he was afterward seen passing most of his time until he died, on the seashore, his gaze fixed on the horizon, and continuing to excite the amazement of all by the accuracy of his predictions.